The Commonwealth of Massachusetts

Office of Public Safety & Inspections

Board of Building Regulations and Standards

1000 Washington Street, Suite 710

Boston, MA 02118

780 CMR - MASSACHUSETTS BUILDING CODE - AMENDMENT PROPOSAL FORM

Code (Indicate with an 'x')	_ Ninth Edition Base X_ Ninth Edition One- and Two-Family Dwellings	*State Use Only*	
Date:	November 5, 2020	**Date Received:**	11-6-2020
Code Section:	AA104 and IECC Chapter 5 [RE]	**Code Change Number:**	11-05-2020
Name and company affiliation if any: Mike Turns, PSD (on behalf of the Massachusetts Program Administrators)			
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Indicate with an 'x' the type of amendment proposed:

X Change Section X Add new section X Delete section and substitute _Delete section; no substitute

___Other, Explain:

Please type below the proposed amendment. If you propose to change a section, please copy the original text from the appropriate 2015 I-code and\or Massachusetts amendment. Indicate with strike out the text you propose to delete and add new text in either *italic* or red font. Also you please provide justification of your proposal as a second page and include information on the **Introduction and Background** of your proposal, **Pro *and* Con Reasons for Adoption** of it, a summary of estimated **Costs for Building Owners**, and **Life Safety Benefits** for building occupants. Also, please indicate whether or not the proposal has been presented to the International Code Council (ICC) for consideration. If not, please explain why the proposal is unique to Massachusetts. When complete email this file to Cesar.Lastra@state.ma.us. Please use additional pages if necessary.

Please see attachment

Introduction and Background:

Pro *and* Con Reasons for Adoption: Pros: Cons:

Costs to Building Owners:

Life Safety Benefits:

Massachusetts Building Code Change Proposal: "Additions and Alterations (Triple A) Stretch Code"

Part 2: Residential construction

This code change proposal is offered on behalf of Mass Save, a collaboration of Massachusetts' natural gas and electric utilities and energy efficiency service providers including Berkshire Gas, Blackstone Gas Company, Cape Light Compact, Eversource, Liberty Utilities, National Grid and Unitil.

Introduction and Background:

Currently, the stretch code does not apply to additions or alterations as Section AA refers to the Existing Buildings chapter just like non-stretch communities. Thus, the efficiency requirements for additions and alterations in stretch code communities are not a stretch at all. Given the high volume of these projects, there is a significant energy savings opportunity for the Commonwealth to add requirements for these project types in the stretch code.

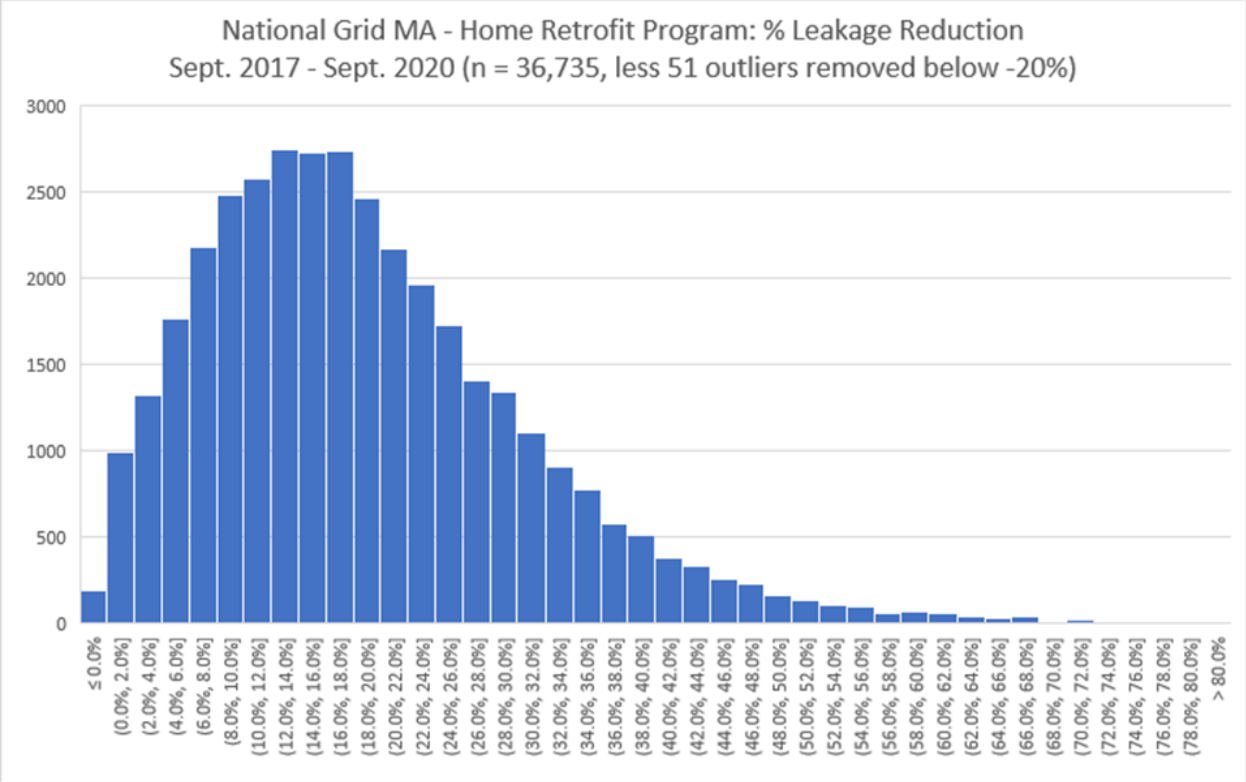
This proposal would improve the energy efficiency of homes undergoing additions or alterations in stretch code communities. The proposed modifications below integrate directly with the structure of Chapter 5 of the IECC Residential Provisions. The three main code sections are:

- R502 Additions
- R503 Alterations, and
- (new) R506 Extensive Alterations.

The elements of this proposal have been vetted and demonstrated to be cost effective. For instance, the building thermal envelope R-values and U-factors in this proposal have all been taken from either the 2021 IECC or NYStretch (the stretch code of New York State). For Climate Zone 5A, a NYSERDA study determined that NYStretch would save $351 per year for a single home with an incremental cost of construction of $2,202 for a simple payback of 6.3 years[1]. The baseline for this analysis was the 2016 Energy Conservation Construction Code of New York State, which is nearly identical to the 2015 IECC, the basis of the current Massachusetts energy code.

Further, local data sources were used to ensure the proposed requirements were appropriate for the Massachusetts construction market. First, a 2020 third-party study measuring industry standard practice for energy efficiency measures in renovations and additions across the state found that many of the provisions in this proposal are already being achieved in most projects[2]. In addition, the air tightness requirement for extensive alterations was chosen from the center of the distribution of blower door test results for over 36,000 homes participating in the Mass Save Home Energy Services / Residential Coordinated Delivery program from Sept 2017 - Sept 2020.

[1] www.nyserda.ny.gov/-/media/Files/Programs/energy-code-training/Residential-Cost-Analysis-Report.pdf
[2] http://ma-eeac.org/wordpress/wp-content/uploads/MARLPNC_1812_RenoAddMarketPotential_Report_Final_2020.03.30_Clean_v2.pdf



Pro and Con Reasons for Adoption:

Pros: Energy bill savings for home wners and renters, increased thermal comfort for home occupants, positive health impacts for home occupants where less air infiltrates uncontrolled through building cavities that can be moldy or dusty, and reduced carbon footprint statewide.

Cons: Small increased cost of construction, but these are likely to be offset by homeowner savings.

Costs to Building Owners:

Small increased cost of construction (likely to be offset by homeowner savings)

Life Safety Benefits:

None

Note: The amendments mentioned in AA104.2 are addressed in a separate code change proposal.

Amendment to R202

R202 Definitions

Add definition:

EXTENSIVE ALTERATION. Any alteration where the total work area exceeds 75 percent of the building or dwelling unit. Work areas in which the alteration work is exclusively plumbing, mechanical or electrical shall not be included in the computation of the total area of all work areas.

Amendment to Stretch Code AA104

AA104 Replace the section with the following:

AA104 Existing Buildings

For alterations, renovations, and additions of existing buildings in these municipalities, the energy efficiency requirements of ~~780 CMR 13.00: Energy Efficiency or Chapter 11 of 780 CMR 51.00 shall be used as applicable~~ AA104.1 through AA104.3 shall be met as applicable based on the use and occupancy of the building.

AA104.1 Existing Low-Rise Residential Buildings

Additions, alterations, repairs, and changes of occupancy or use in all one- and two-family dwellings and multiple single-family dwellings (townhouses), as well as Groups R-2, R-3, and R-4 of four stories or less above grade plane, shall comply with 780 CMR 51.00 Chapter 11 Sections R501 through R505 as amended below, and Sections R506 and R507.

AA104.2 Existing Commercial Buildings

Additions, alterations, repairs, and changes of occupancy or use in all non-residential and R-use buildings of more than four stories shall comply with 780 CMR 51.00 Chapter 11 Sections C501 through C505 as amended below.

AA104.3 Existing Large Area and High Energy Use Buildings: Reserved

R502 Additions

R502.1.1.1 Replace section with the following:

> **R502.1.1.1 Building envelope.** New building envelope assemblies that are part of the *addition* shall comply with Sections R402.1, R402.2, R402.3.1 through R402.3.5, and R402.4, where Table R402.1.1 and Table R402.1.3 are replaced with Table 502.1.1.1(1) and Table 502.1.1.1(2), respectively. Projects using R402.1.5 to document compliance shall achieve 10% better than code.

TABLE 502.1.1.1(1)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION U-FACTOR[b]	SKYLIGHT U-FACTOR[b]	CEILING R-VALUE	WOOD FRAME WALL R-VALUE[c]	MASS WALL R-VALUE[d]	FLOOR R-VALUE	BASEMENT WALL R-VALUE[e]	SLAB R-VALUE & DEPTH[f]	CRAWL SPACE WALL R-VALUE[e]
5	0.27	0.50	60	20+5ci or 13+10ci or 0+15ci	15ci/19ci	30	20 or 15ci	10, 4 ft	20 or 15ci

NR = Not Required

ci = continuous insulation

For SI: 1 foot = 304.8 mm.

a. R-values are minimums. U-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed R-value of the insulation shall be not less than the R-value specified in the table.

b. The fenestration *U*-factor column excludes skylights.

c. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, “13+10” means R-13 cavity insulation plus R-10 continuous insulation.

d. Mass walls shall be in accordance with Section R402.2.5. The second R-value applies when more than half the insulation is on the interior of the mass wall.

e. “15/19” means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.

f. R-10 continuous insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation R-value for slabs as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.

TABLE 502.1.1.1(2)
EQUIVALENT U-FACTORS[a]

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	WOOD FRAME WALL U-FACTOR	MASS WALL U-FACTOR[b]	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR
5	0.27	0.50	0.020	0.045	0.056	0.033	0.050	0.042

a. Non-fenestration U-factors shall be obtained from measurement, calculation or an approved source.

b. Mass wall shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall U-factor shall not exceed 0.056.

R503 Alterations

R503.1 Add text to end of section.

Extensive alterations shall comply with Section R506.

R503.1.1 Replace section with the following:

R503.1.1 Building envelope.

Building envelope assemblies that are part of the alteration shall comply with Tables R503.1.1(1) and R503.1.1(2).

Exceptions: The following alterations shall not be required to comply with the requirements Table R503.1.1 provided that the energy use of the building is not increased:

1. Storm windows installed over existing fenestration
2. Construction where the existing roof, wall or floor cavity is not exposed
3. Roof recover
4. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provide that the code does not require the glazing or fenestration assembly to be replaced.

TABLE R503.1.1(1)
INSULATION REQUIREMENTS BY COMPONENT[a]

Ceiling with attic space R-value	Ceiling without attic space R-value [e]	**2x4** wood frame wall R-value	**2x6** wood frame wall R-value	Mass wall R-value[f]	Floor R-value[g]	Basement wall R-value	Crawl space wall R-value
60[b,c,d]	30	13	20	15ci/20ci	30	R-20 or 13+5ci or 15ci	R-20 or 13+5ci or 15ci

ci = Continuous insulation

a. R-values are minimums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed R-value of the insulation shall be not less than the R-value specified in the table.

b. When adding insulation to an existing attic, or where any portion the finished ceiling surface is removed, ceilings with attic spaces shall be insulated to R-60 across the entire assembly area. Prior to insulation installation, seams between the exterior wall top plate and sheathing and exterior wall top plate and interior finished surface shall be caulked or otherwise sealed. Also prior to insulation installation, baffles shall be installed accordance with R402.2.3.

c. Installing R-49 over 100 percent of the ceiling area requiring insulation shall be deemed to satisfy the requirement for R-60 wherever the full height of uncompressed R-49 insulation extends over the wall top plate at the eaves.

d. Where R-60 insulation is installed, tapering at the eaves is permitted provided the maximum possible R-value is achieved between the attic floor and ventilation baffles.

e. Applies when the cavity is exposed from the interior or the sheathing or insulation is exposed during reroofing.

f. Mass walls shall be in accordance with Section R402.2.5. The second R-value applies when more than half the insulation is on the interior of the mass wall.

g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.

TABLE R503.1.1(2)
REPLACEMENT FENESTRATION REQUIREMENTS[a]

FENESTRATION U-FACTOR[b]	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC
0.27	0.50	0.40

a. U-factors and SHGC are maximums.

b. The fenestration *U*-factor column excludes skylights.

R503.1.2 Add sub-section as follows:

R503.1.2.1 Existing ducts, plenums, air handlers, and filter boxes

When heating or cooling equipment is replaced, existing accessible ducts, plenums, air handlers, and filter boxes shall be sealed per R403.3.2. Existing accessible ducts shall also be insulated per R403.3.1. Where insulation is disturbed, the insulation installation quality shall be returned to its original condition or better.

R503.1.4 Delete exception and add subsection as follows: When heating or cooling equipment is replaced, accessible existing duct work shall be insulated per R403.3.1 and sealed per R403.3.2. Where insulation in ceilings with attic spaces is disturbed, insulation installation quality shall be returned to its original condition or better.

R503.1.4.1 Lighting in existing fixtures

For any alteration requiring a permit, all lamps in existing permanent fixtures shall contain high efficacy lamps.

R503.2 Change section number to R507 and move to end of chapter

R505 Change of occupancy or use

R505.1 Revise section as follows:

R505.1 General

Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with Section R502.

R505.2 Revise section as follows:

R505.2 General

Any space that is converted to a dwelling unit or portion thereof from another use or occupancy shall comply with Section R502.

R506 Add section as follows:

R506 Extensive Alterations

R506.1 Extensive Alteration Approved Energy Compliance Methods

Buildings or dwelling units undergoing *extensive alterations* shall meet the requirements of Sections R506.2, R506.3, or R506.4.

1. Prescriptive (R506.2)
2. ERI (R506.3)
3. Passive House Institute EnerPHit certification (R506.4)

R506.2 Prescriptive Compliance

For prescriptive compliance, buildings or dwelling units following this path shall comply with the requirements of Sections R506.2.1 through R506.2.5.

R506.2.1 Building envelope.

The building thermal envelope shall comply with the requirements of Sections R506.2.1 through R506.2.5.

R506.2.1.1 Insulation and fenestration criteria

Replacement fenestration and building cavities exposed during construction shall meet the requirements of Table R506.2.1.1(1) and Table R506.2.1.1(2).

R506.2.1.2 Ceilings with Attic Spaces R-value

Each dwelling containing a vented attic shall have a minimum of R-60 ceiling insulation regardless of whether the ceiling is part of the alteration.

Exceptions:

1. Installing R-49 over 100 percent of the ceiling area requiring insulation shall be deemed to satisfy the requirement for R-60 wherever the full height of uncompressed R-49 insulation extends over the wall top plate at the eaves.
2. Installing R-49 over 100 percent of the ceiling area requiring insulation shall be deemed to satisfy the requirement for R-60 wherever the full height of uncompressed R-49 insulation extends over the wall top plate at the eaves.

Table R506.2.1.1(1)

Exposed Cavity Insulation Requirements[a]

Ceiling without Attic Space R-Value	Framed Wall R-Value	Mass Wall R-Value[c]	Floor R-Value[c]	Basement Wall R-Value	Crawl Space Wall R-Value[c]
R-30	R-20 or 13+5ci[b] or 0+15ci	15ci/20ci	R-30 or 19+5ci	R-20 or 13+5ci or 15ci	R-20 or 13+5ci or 15ci

ci = Continuous insulation

a. R-values are minimums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed R-value of the insulation shall be not less than the R-value specified in the table

b. The first value is cavity insulation, the second value is continuous insulation

c. The second R-value applies where more than half of the insulation is on the interior of the mass wall

Table R506.2.1.1(2)

REPLACEMENT FENESTRATION REQUIREMENTS[a,c]

FENESTRATION U-FACTOR[b]	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC
0.27	0.50	0.40

a. U-factors and SHGC are maximums.

b. The fenestration *U*-factor column excludes skylights.

c. Not greater than 15 square feet of glazed fenestration per dwelling unit shall be permitted to be exempt

R506.2.1.3 Air leakage

Each building or dwelling unit shall achieve a minimum 15 percent infiltration reduction as determined with pre-construction and post-construction blower door tests or achieve a minimum infiltration rate of 7 ACH50, whichever is a lower final infiltration rate.

Exceptions:

1. Dwelling units where less than 50 percent of the building thermal envelope cavities are exposed during the alteration are exempt.
2. Pre-construction blower door testing and a 15 percent infiltration reduction are not required if a post-installation blower door test verifies the infiltration rate to be 3 ACH50 or lower.

Where the final tested air leakage rate is 5 ACH50 or lower, whole-house mechanical ventilation shall be installed per the *International Energy Conservation Code Section* R403.6, as amended.

R506.2.2 Heating and cooling systems

R506.2.2.1 New heating and cooling systems

New heating, cooling and duct systems that are part of the alteration shall comply with Section R403.

> **Exception:** Where ducts from an existing heating and cooling system are extended to an addition, duct systems with less than 40 linear feet (12.19 m) in unconditioned spaces shall not be required to be tested in accordance with Section R403.3.3.

R506.2.2.2 Existing ducts, plenums, air handlers, and filter boxes

When heating or cooling equipment is replaced, existing accessible ducts, plenums, air handlers, and filter boxes shall be sealed per R403.3.2. Existing accessible ducts shall also be insulated per R403.3.1. Where insulation is disturbed, the insulation installation quality shall be returned to its original condition or better.

R506.2.3 Service hot water systems

New service hot water systems that are part of the alteration shall comply with Section R403.5.

R506.2.4 Interior Lighting

For any alteration requiring a permit, existing lamps in permanent fixtures shall be replaced with high efficacy lamps throughout the entire dwelling unit.

R506.2.5 Exterior lighting

For Group R buildings, exterior lighting shall comply with Section C405.5.

R506.3 Energy Rating Index Alternative

Compliance with this section requires that the provisions of Sections C406.3 through C406.6 of CMR 780 51.00 are met. Maximum HERS Index values shall be in accordance with the *Whole House Renovations; Additions* column of Table R406.4.

R506.4 Passive House Institute EnerPHit certification

Compliance with this section requires that each building or dwelling unit meets the provisions of the Passive House Institute EnerPHit program. Pre-certification by a certified Passive House Consultant or certified Passive House Designer shall be provided to the code official prior to issuance of a permit and a verified “as-built” EnerPHit report shall be provided to the code official prior to issuance of the certificate of occupancy.

R507 Add section as follows

R507 Change in space conditioning

Any nonconditioned or low-energy space that is altered to become conditioned space shall meet the requirements of Section R502 as amended.

AA104.3 Existing Large Area and High Energy Use Buildings: Reserved